Decision-Support for Service Bundling

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Abstract. Offering service bundles to the market is a promising option for service providers to strengthen their competitive advantages, cope with dynamic market conditions and deal with heterogeneous consumer demand. Although the expected positive effects of bundling strategies and pricing considerations for bundles are covered well by the available literature, limited guidance can be found regarding the identification of potential bundle candidates and the actual process of bundling. The proposed research aims at filling this gap by offering a service bundling method complemented by a proof-of-concept prototype, which extends the existing knowledge base in the multidisciplinary research area of Information Systems and Service Science as well as providing an organisation with a structured approach for bundling services.

Keywords: Service, service-orientation, bundling

1 Introduction

The interest in service-orientation has increased over the last years due to new technological developments [1] and novel approaches for organizational management [2] since services have become focal units for the cost-effective creation of customer value and innovation. The multidisciplinary nature of service-oriented concepts has led to the emergence of Service Science as a new academic discipline [3]. Business Service Management (BSM) can be positioned as the business discipline within Service Science dedicated to the holistic management of services in an organization to ensure alignment between the needs of the customer and the objectives of the organization [4].

Business Service Management is a research project as part of the Smart Services Cooperative Research Centre (CRC) research initiative.[1] An essential component of the strategic side of BSM is Service Portfolio Management (SPM) [5], which is one of the work packages within the BSM project and is led by Prof. Michael Rosemann, who is also the principle supervisor of the candidate's research.[2]

[1] Please refer to http://smartservicescrc.com.au

[2] Associate Supervisors are Dr. Axel Korthaus and Dr. Erwin Fielt. Both are postdoctoral research fellows at the Queensland University of Technology.

In focus of SPM is the service portfolio, which comprises a well-defined set of services. Offering innovative service bundles to the market is a promising option for service providers to strengthen their competitive advantages, cope with dynamic market conditions and heterogeneous consumer demand [e.g. 6]. Service bundles are composed of at least two services that can be integrated to a certain extend to create a new packaged service offering. Therefore, a key task within SPM is service bundling that deals with the challenge of identifying services within the portfolio that can and should be used to create service [5]. A demanding managerial task exists in comprehending potential service candidates offered internally and externally, and being able to identify service bundles that lead to new efficient and strategically-aligned packages.

Literature lacks approaches that facilitate the creation of adequate service bundles. Despite the fact that companies across all industry sectors with increased market pressures are challenged by the issue of service bundling [7], only little guidance has been provided so far for the identification of potential bundle candidates and for the actual process of bundling to answer the questions: "How can services be identified that should be bundled?" and "how can the act of service bundling be effectively and efficiently supported?".

The research related to the candidate's studies tries to answer these questions by developing a service bundling method. In particular, it will focus on the perspective of a service provider. Existing methods for service bundling usually use a given customer demand to drive the creation of service bundles [7-9]. While these methods are useful for situations where customer demand is well known and understood, poor performance can be expected when demand is hard to capture or anticipate. As customer-driven service bundles typically relate to an outside-in perspective, the induction of new, innovative bundles to the market to trigger demand is not yet sufficiently covered. The proposed method will fill this gap and provide an inside-out perspective on service bundling. The main contribution of the research is therefore a structured guideline to facilitate the composition of bundles in practice. Designed as an innovative artefact it extends the knowledge base of service management, while facilitating a multi-disciplinary approach honouring the importance of business and IT alignment. As a proof of concept, the method will be complemented by a software prototype.

The remainder of this paper is structured as follows. Based on the problem description that has been provided in this section, we first present related work and alternative approaches in this area of research, before the foundations of our approach will be detailed further. Subsequently, a detailed research design that aims at providing a structured guideline to answer the stated research questions will be described. Finally, the current status of the research is presented before the paper ends with a conclusion and directions for further research.

2 Related Work and Alternative Approaches

The objective of this research is to provide a service bundling method. A review of the academic knowledge base yields various possible approaches that can be utilized to identify service bundles as pointed out in [10].

For example, the area of artificial intelligence (AI) research offers techniques that can potentially support the design of solutions to the service bundle identification problem. Particularly, machine learning solutions are conceivable that can "learn" from existing successful service bundles to identify or propose new service bundles [e.g. 11]. A general problem of machine learning is that it usually does not yield absolute guarantees of the performance of algorithms. Moreover, in spite of many successes, AI research in general has been the target of fundamental criticism [e.g. 12]. To the best of the authors' knowledge, comprehensive AI approaches to identify and analyze new service bundles are not existent in the academic knowledge base.

Business Intelligence (BI) employs systems that "*combine data gathering, data storage, and knowledge management with analytical tools to present complex and competitive information to planners and decision makers"* [13]. Hence BI is used to analyze existing data to support future decisions. Within BI, the area of Association Rule Mining can be employed to identify bundle candidates. This mining approach analyses basket data type transactions, for example receipts from a supermarket, to identify items that are frequently bought together within one transaction [14]. The identified so called *frequent item sets* are used for recommender systems to offer customers related products, hence enabling cross-selling potentials (e.g. Amazon.com).

The ideas of Semantic Web approaches can be utilized as well. These approaches generally require three sorts of machine-understandable information: "*ontologies to define vocabulary, data about observations of the world, and theories that make predictions on such data"* [15]. An ontology specifies an explicit, simplified view of the world [16]. Using these artifacts, it is possible to model the relations between services and reason about them. This has been done for web services in the Web Service Modeling Ontology [17] and for real-world services using the OBELIX (Ontology-Based Electronic Integration of Complex Products and Value Chains) service ontology [7].

A different semantic approach utilizes Latent Semantic Indexing (LSI), also called Latent Semantic Analysis. Latent semantic indexing is an "*information retrieval technique based on the spectral analysis of the term-document matrix"* [18]. This is done through the creation of vector spaces using a mathematical technique called singular value decomposition. The created vector spaces can be queried for the semantic distance (usually expressed as a vector) between two terms or service descriptions, and the so found semantic relationships can be utilized to identify clusters or bundles of services. LSI requires no formal ontology that classifies the different elements of a service [19] and uses unstructured text documents as the only source of information. Several limitations to LSI restrict its usage, the main drawback being that the underlying vector space model "*is unable to convey any relationship [...] existing between the terms"* [20].

All of the introduced identification approaches can be expected to provide interesting results for a bundling method. As motivated in the next section, the

proposed method is based on service descriptions. Thus, a semantic approach has been chosen. Instead of employing a formal ontology, the notion of relationships is used to discover semantics between services. This ensures the simplicity of the method and its utility across a range of different service descriptions.

The single work that specifically targets service bundling is from Baida (please refer to [8]). The author used an ontology-based approach "*to facilitate the automation of the service bundling task"*. The created ontology includes the notion of resources as prerequisites or outcomes of service elements and so-called functions and relationships that define dependencies between two service elements (e.g. enhancing, excluding, and substituting). Using a given customer demand by expressing required resources, the method can create service bundles that satisfy the demand and adhere to the predefined set of dependencies between services. The author named his approach "Serviguration" to express his view of service bundling as a configuration task. A detailed discussion of the differences and distinguishing characteristics of the "Serviguration" approach and the proposed approach will follow in the next section.

3 Conceptual Framework for a Service Bundling Method

Preliminary Considerations

The purpose of the proposed method is the identification of possible service bundles. It is designed to support the process of bundle creation in its early stages. The method therefore focuses on limiting the solution space of possible bundles, using indicators that express some form of bundling motivation as described in [10].

It is important to point out that this method is not supposed to omit the evaluation of bundles by a domain expert. It has to be acknowledged that the domain expert is still needed to evaluate the overall feasibility of bundles, since this requires complex analysis, often utilizing tacit knowledge across a range of different disciplines (e.g. economy, marketing, legal). Rather, the aim of this method is to limit the scope of the necessary evaluation for the domain expert.

This approach is particularly useful when a large number of services are available, which is a common scenario particularly in business networks or service ecosystems [21]. Since a human expert would be overwhelmed by the task, the proposed method could be applied in an automated way using a corresponding support tool in order to quickly constrain the solution space of possible bundles. Consequently, the domain expert can focus on evaluating only the short-listed bundles that somehow indicate a bundling opportunity.

[8] relies on a given customer demand to drive the creation of service bundles. While this approach can be useful for situations where customer demand is well known and understood, poor performance can be expected when demand is hard to capture or anticipate. Furthermore, the economically desirable situation where customer demand is induced by a new service offering is not supported at all. Our proposed method explicitly targets the latter case by focusing on the creation of new and innovative service bundles. Therefore, customer demand is not utilized to reason about the suitability of potential bundles in this method. Instead, the driving source of

this method is a repository of services that are available for bundling. Depending on the given context, this repository might consist of the services of a single provider, a provider network or even contain all available services in a service ecosystem.

The bundling method created by [8] identified six distinct relationships that define dependencies between two services: core/enhancing, core/supporting, bundled, substitute, excluding, optional bundle. The (manual) evaluation of all services regarding these relationships is a prerequisite for the actual bundling process, as the feasibility of bundles is determined by the existing relationships. This evaluation is a time consuming task, one that becomes practically impossible to handle for a large set of services.

The proposed approach is therefore based on a service description which does not necessitate the step of explicating relationships between services. Instead, this method uses commonalities of attributes that indicate such a relationship. As long as services are consistently described and attributes relevant for this bundling approach are present, the proposed method can be employed. The following section will explain the term relationship as used in this method.

Leveraging Relationships between Services

[22] found that functionally complementary components in a bundle lead to high intentions to purchase compared to bundles in which no complementary components are present. The authors state that, "*as the relationship among the components increased from "not at all related" through "somewhat related" to "very related", intention to purchase also increased"*.

This method builds upon these findings and the conjecture that other commonalities or relationships between services can also indicate potentially useful bundles. For this method the term relationship is defined as *a connection, whose existence can be evaluated by a logic expression.* A relationship builds upon attributes from services' descriptions. Every relationship refers to previously specified attributes (e.g. location of a hotel, destination of a flight) and evaluates them using a given logic (e.g. distance between destination airport and location of the hotel). This evaluation can be realized ranging from simple value comparisons of single attributes to complex algorithms using multiple attributes. Figure 1 illustrates the coherence between the mentioned terms using UML.

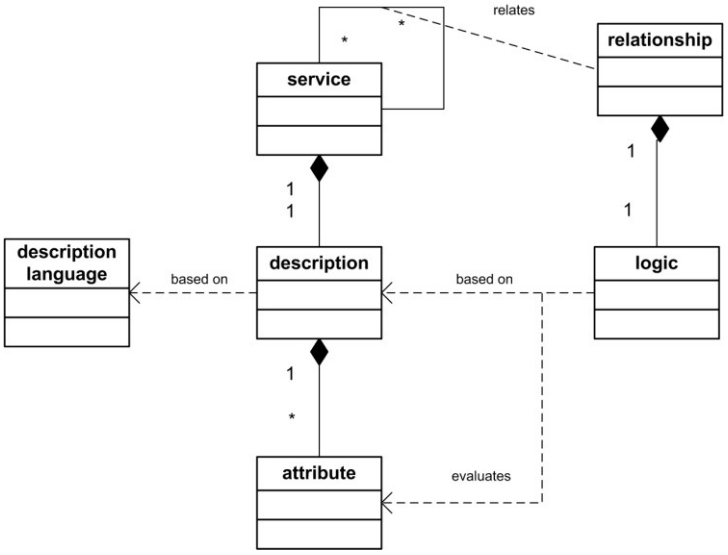

Figure 1: Concept of a Relationship

Relationships can display varying degrees of strength. For example, the distance between arrival airport and hotel determines the strength of this relationship. It depends on the concrete scenario and type of involved services as to whether a certain distance translates into a strong or weak relationship. Therefore the domain expert can configure the logic, where this is applicable. A first set of empirically derived relationships are presented in [10].

4 Detailing the Research Methodology

The overall research can be positioned in the area of Information Systems and Service Science research focusing on design science [23], as the service bundling method can be regarded as an innovative artifact to solve a contemporary problem. As a proof of concept, the method will also be supported by a software prototype, which represents another artifact. The research will be classified according to the design science approach with a strong action research flavor. Within this approach, different methods will be applied to satisfy the relevance and rigor criteria and align with the guidelines postulated by [24]. The research methodology can be divided into five stages, which will be shortly described in the following.

During the *preparation stage* a thorough literature review will be conducted to synthesize existing knowledge and position the proposed research within the overall body of knowledge. Thus, initial, preliminary answers will be found for research questions. Hereby, the literature review will provide initial answers regarding the nature and characteristics of services/SPM, the different types of bundling, the existing service description languages and service bundling/development

methodologies. These insights will be used to articulate a preliminary draft of a service bundling method.

The second stage, *analysis stage*, aims at deriving empirical insights into the foundations of bundling by conducting a content analysis of existing bundles and services. The scope of the analysis will include traditional bundles found in the business domain as well as novel, integrative bundles found in the IT domain. The outcome of this stage will be a set of factors that potentially contribute to the composition and in particular support reasoning about the feasibility of bundles. The content analysis will comprise the development of a questionnaire to identify initial relationships between services in a bundle that can be used to reason about the suitability of service bundles. Rigorous design science research must also take into considerations existing theories and frameworks. As part of this stage, existing theories will be analyzed to support a theory-driven design of the bundling method.

Once the related literature review and content/theory analysis have been conducted, it is envisaged to conduct at least one case study to complement the theoretical findings with empirical data about the current and desired situation as part of the *exploration stage*. The exploratory case studies are of an observable nature. The main objective is to find out about current SPM practices. As such we want to analyze the current way of describing services, practices of bundling services and portfolio management as well as requirements for a decision-support tool and method for service bundling as part of SPM. The requirements will be used at a later stage to design and validate the main artifact.

The fourth stage, *design stage*, is focused on designing the service bundling method (and its tool-support). Hence, this stage can be regarded as the core of design science research [23-25]. Once the final set of dimensions and requirements have been empirically identified, a gap analysis needs to be conducted to analyze the deficiencies of existing frameworks/methodologies and service description languages. The gap analysis will provide important insights of possible extensions of existing work as well as additional requirements for the service bundling method, which will be developed in this stage. The design phase of the artifact will be nourished by the results of the previous stages. Hence, insights gained through the literature review will be incorporated as well as insights gained through the case studies. Furthermore, empirical and theoretical insights gained in stage two as well as the requirements gathered in stage three will provide the basis for the specification of scope and features of the method and tool. The outcome of this stage is a tool-supported service bundling method that satisfies the requirements of the case study partners (relevance) and has been built upon existing knowledge and findings (rigor).

The *evaluation stage* focuses on evaluating the developed bundling method. According to the guidelines postulated by [24] and the requirements of design science by [25], an artifact needs to prove its utility and validity in a real world scenario. As the developed artifact of this study is a tool-supported service bundling method, a valid research method that aligns with the objectives of the study and the interest of the candidate is action research. Hereby, existing methods and expertise will be applied from the knowledge base to evaluate the tool-supported bundling method. The final outcome of this stage will be an evaluated tool-supported service bundling method.

5 Current Status

As pointed out previously, the first stage comprises activities to arrive at a synthesized view on the existing knowledge base related to services / SPM, different types of service bundling and a first draft of the bundling method. The results of this stage have been published in [4, 5] and [26] respectively.

In regard to stage two, we derived a first working set of generic relationships based on the proposed content analysis and subsequent empirical studies. Results have been synthesized and are published in [10]. An analysis of potentially applicable theories is still ongoing.

As pointed out in the last section, we aim at conducting at least one exploratory case study to gain empirical insights into SPM and bundling practices. As part of this stage, we were able to commence a comprehensive case study with a government authority. Hereby, it is envisaged to bundle services that can be accessed by potential consumers, namely public citizens, by utilizing the online channel. Hence, our research in that area touches upon current advances in the area of e-government as it aims at identifying ways to enhance the consumer satisfaction through the specification of service bundles that are presented on the government's webpage. The bundles comprise services that are offered by multiple departments to ease access and enhance the overall consumer satisfaction. By doing this, consumers no longer need to consult multiple departments and their respective websites as all services of potential interest are comprised within specific bundles. Furthermore, citizens do not need to know the internal structure of governments anymore in order to find their services of interest.

As part of this case study we will be able to accompany this specific government on its way to implement a customer-centric one-stop portal that comprises the presentation of service bundles. Currently we are observing market studies that aim at analyzing the potential benefits of offering services in bundles as part of a one-stop portal strategy. Furthermore, we are conducting several interviews with multiple other governments that already implemented such a one-stop portal based on service bundling activities in order to gain additional empirical insights. Finally, we will take part in all activities that are directly conducted by our case study partner in order to achieve their objectives successfully, such as conducting usability testing sessions with a representative sample of the targeted user group. This case study provides us with an unique opportunity to gather empirical insights into the bundling process and helps us to answer our research questions. First findings look very promising and will be in a more advanced stage in the near future.

Regarding stages four and five, we first need to successfully finish the other stages before we can actively target the activities in these stages.

6 Conclusion

This paper describes a research project proposing a novel approach to identifying service bundle candidates. Because of its potential to combine innovation with cost-effective re-use of existing services, we envision that service bundling will become as

important as new service development as, for example, can be seen in the growing attention for mash-ups. However, while the process of new service development has been extensively researched and conceptualized, the process of finding suitable service bundling candidates is still ill-defined.

The described research project proposes a method that facilitates the creation of bundles by providing organizations with systematic and practical guidelines. The method is a contribution to design science research in the field of Information Systems and Service Science. It represents an innovative artifact that extends the academic knowledge base related to service management. The developed method builds on service bundling concepts from both the marketing and the technological literature, thereby addressing the increased need for business-IT alignment. As such, it also is an example of a multi-disciplinary approach that builds on existing research in different areas and extends this research in new directions.

Based on the descriptions and explanations in the previous sections, multiple directions for further research can be identified. First, the "service bundling" task needs to be positioned as part of a management discipline. First insights suggest to position service bundling as a key task of service portfolio management, but further research needs to be conducted. Second, research in the area of service descriptions has to be conducted to develop a universal service description language that is applicable across industries and covers business as well as software services. Alternatively, extant service description languages need to be analyzed to determine in how far they accommodate the identified relationships and provide possibilities to be extended. Third, strategies and rationales of service bundling need to be analyzed further, to provide valuable insights for the internal and external validation of initially identified bundles.

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